INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 1998	**Park:** Shenandoah NP
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Permit#:
SHEN1998N-229

Park-assigned Study Id. #:
unknown

Project Title:
A Low Flow/High Flow Comparison Of Dissolved Organic Matter Concentrations And Bacterial Growth In An Appalachian Stream

Permit Start Date: Jan 01, 1998	**Permit Expiration Date** Jan 01, 1999
Study Start Date: Jan 01, 1997	**Study End Date** Jan 01, 1998

Study Status:
Completed

Activity Type:
Research

Subject/Discipline:
Water Resources

Objectives:

I. Evaluate the magnitude of the dissolved organic nitrogen (DON)contribution to total N concentrations in Paine Run, and describe dissolved organic carbon (DOC) and DON concentrations and annual fluxes in Paine Run.;II. Put the detailed temporal measurements made for Paine Run into a more general spatial context, extending to other streams in the Shenandoah National Park.;III. Test the hypothesis that stormflow dissolved organic matter (DOM) will be higher in concentration and different in N/C than baseflow DOM in Paine Run.;IV. Use observed patterns of stormflow DOM concentrations and N/C to evaluate potential hydrological source paths of DOM during storms.;V. Compare bacterial growth on baseflow vs. stormflow streamwater, using a standardized bioassay across several events and seasons.

Findings and Status:

Status: Project is now finished. Summary of results:;DOM concentrations in Paine Run were very consistent during baseflow and did not show a seasonal pattern, with a mean of 71 uM DOC and 1.7 uM DON (n=85 samples). These levels are typical of mean annual (1997) baseflow DOM concentrations measured in 15 other streams in Shenandoah National Park (SNP), which ranged from 49-98 uM DOC and from 1.1-3.2 uM DON. DON contributed 15% of the dissolved-N flux in Paine Run, and 16% in the quarterly survey of SNP streams, while nitrate was the most abundant N-containing solute in all of the sampled streams.;During storms, mean DOC concentration was significantly elevated, by an average of +108%, and DON was elevated by an average of +76%. The maximum DOC concentration always occurred on the rising limb, averaging 228 uM, more than 3x the concentration during baseflow. Stormflow (4% of the time, 36% of the annual discharge) contributed >50% of DOC, DON and NO3- flux in Paine Run during 1997.;The rapid response of DOC concentration increase suggested a near-stream source of DOM, which is most likely upper soil layers in the riparian zone, saturated overland flow, and/or channel elongation. Flow played a major role in controlling DOM concentrations in Paine Run, and 62% of the variability in DOC concentration during the study period was explained by a simple linear relationship to "relative flow" (QREL). QREL is a hydrological parameter developed to describe the current stream discharge normalized to antecedent discharge levels.;The fraction of DOM which was bioavailable, as measured by the growth rate constant normalized to sample DOC concentration, was not significantly different for stormflow as compared to baseflow water in Paine Run. In spite of the consistently low fraction of bioavailable DOM, increased DOM concentrations and bacterial

abundance during storms are likely to increase in situ bacterial growth rates. The fraction of the total stream DOC pool taken up by water column bacteria was estimated to increase from 0.03% per h during baseflow, to 0.15% per h during storms. This uptake rate would have a minimal impact on bulk DOC and DON concentrations in Paine Run, since water column residence times are so short (1-3 h) in the catchment. However, storms are still expected to have considerable impact on the bacterial strema communities, by mobilizing them into the water column and by supplying a transient pulse of water high in DOM.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
0	0

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
n/a	0